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The NIH Undergraduate Scholarship Program: Career Outcomes of Scholars and Non-Awarded Finalists

Final Report

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CHAPTER I

INTRODUCTION

Through the Undergraduate Scholarship Program (UGSP), the National Institutes of Health (NIH) began offering scholarships in 1996 to outstanding undergraduate students from disadvantaged backgrounds to encourage them to pursue careers in biomedical research and to attract them to the intramural research program at the NIH. The program is administered by the Office of Loan Repayment and Scholarship (OLRS) within the Office of the Director of NIH. As the UGSP has matured, OLRS has increasingly turned its attention to program improvement and program evaluation.

This report is part of an ongoing effort by Mathematica Policy Research, Inc. (MPR) to provide OLRS with information and analysis to support its evaluation needs. Previous reports in the series have focused on recruiting and outreach (Humphrey and Glazerman 2001) and program operations (Silva 2004). This report presents findings from an evaluation of outcomes for UGSP participants ("Scholars").

THE UGSP OUTCOMES EVALUATION

The UGSP outcomes evaluation addressed the following research questions:

- What career outcomes have UGSP Scholars achieved?
- Did they achieve career success and stay on track during their college years to becoming a biomedical or heath services researcher?
- Did they remain on track beyond their college years?
- Did they achieve special career milestones, such as publications in academic journals, employment in research settings, or completion of graduate degrees?
- How do those career outcomes compare to UGSP applicants who were not accepted to the program ("finalists")?

Although the questions are essentially specific to UGSP Scholars, the report discusses the experience in the UGSP and related programs of both Scholars and finalists because it is

important to recognize that those who applied for, but did not receive, scholarships were part of a very talented pool of candidates and may have had other options and opportunities for enrolling in scholarship, mentoring, or career enhancement programs.

SELECTION EFFECTS AND VALUE ADDED

Although comparisons between Scholar and finalist outcomes are useful for placing the former in context, the comparisons must be interpreted with care. Applicants to the UGSP are unusually talented and motivated, and those who are selected as finalists are judged by the review committee's rigorous selection process as especially promising. If the selection process works as intended, the students who are awarded scholarships are the most motivated and talented of the group. Therefore, we should expect to see differences in outcomes regardless of any effects of the program itself. Thus, even if the UGSP did not exist, those selected for the program should have better career outcomes, which we call "selection effects."

But the UGSP does more than just identify promising scholars. As described below, the program provides considerable financial and peer support as well as research opportunities and mentoring. All of these services could make Scholars more likely to both stay on track to becoming a research scientist and to achieve career successes on the path to becoming a biomedical researcher than if they had not participated. We call these effects the "value added" of the program.

The outcomes analysis presented here provides information on the combined selection effects and value added of the program.

UGSP BACKGROUND

The UGSP is best defined by eligibility criteria, the selection criteria and process, and the program components. (More detailed information on recruiting and outreach appears in an earlier report by Humphrey and Glazerman [2001]. More detailed information about program operations and how they are viewed by staff and participants appears in the UGSP process report [Silva 2004].)

Eligibility Criteria

To be eligible for the UGSP, an applicant must:

- Be a U.S. citizen, national, or qualified noncitizen eligible to work for the United States government
- Be enrolled or accepted for enrollment as a full-time student at an accredited four-year undergraduate institution for the upcoming academic year
- Have a college grade point average (GPA) of at least 3.5 (on a 4.0 scale) or be in the top 5 percent of his or her class

- Come from a disadvantaged family and have "exceptional financial need," defined as low income according to guidelines published each year by the U.S. Department of Health and Human Services—for example, gross income for a family of four in calendar year 2002 had to be below $36,800 to qualify

- Be eligible for federal employment, free of federal judgment liens and delinquent federal loans, and have no conflicting service obligations

Selection Criteria

Beyond meeting these basic eligibility requirements, applicants are selected as finalists and ultimately as Scholars according to very specific criteria. For instance, applicants must demonstrate, through short essays on the application form, a sincere interest in pursuing a career in biomedical or behavioral and social science health-related research. Applicants must also list and explain any special recognitions, scholastic awards and honors, and other scholarships they have received; in addition, they must describe their initiative, work habits, leadership skills, creativity in problem solving, and ability to work as a member of a team. Finally, all applicants must arrange for written recommendations from three individuals who have direct knowledge of their research and academic abilities.

OLRS staff review the applications and select 30 to 45 as semifinalists. A review committee composed of NIH and outside scientists then scores the semifinalists applications on a five-point scale along several dimensions (academic performance, interest in science, communication skills, leadership skills, and general potential) and ranks them, selecting the top ranked applicants as finalists. The panel then interviews the finalists in person and chooses about 15 scholarship recipients, or Scholars, based on the interview.[1]

Program Components

The UGSP pays Scholars up to $20,000 per year for tuition and other college expenses. The term of the scholarship is one year, but Scholars may apply to renew for up to a total of four years of support, assuming they begin as freshmen. While they are in the program, Scholars are required to designate an academic advisor at their undergraduate institution. In addition, for each year of support, Scholars incur two service obligations.

The first service obligation is a paid, 10-week, summer research internship after each academic year of funding at the NIH campus in Bethesda, Maryland. Each Scholar is matched with one or more NIH researchers, typically in a research laboratory, who serve as mentors. While conducting their summer research, the Scholars live together in NIH-provided housing and attend a variety of formal seminars and program activities.

[1] During the initial years of the program, in-person interviews were not conducted as part of the application process. Review panelists considered only written application materials.

The second service obligation is employment at NIH after graduation. After completing college, Scholars must take a full-time paid position in an NIH research laboratory, working one year for each academic year in which they received UGSP funding. This service obligation, known as "payback," can be deferred while students pursue graduate studies that will lead to a career in biomedical research.

CHAPTER II

METHODS AND DATA

The goal of the outcomes evaluation was to provide NIH with information on the early career outcomes of UGSP Scholars and a comparison group of students with similar backgrounds and interests. To accomplish this goal, we collected data on all students who ever applied to the UGSP and who reached at least the semi-final round of the selection process. The data came from three sources. First, we used applicant data from OLRS, which consists of the information supplied by students when they applied to the program as well as scoring and rating information from the selection process. Second, we merged these data with OLRS administrative records on the program itself, which includes updated contact information and data on summer and payback experiences for Scholars only. Finally, we developed and administered a retrospective survey, the Career Survey of Science-Oriented Scholars, to everyone who had applied to the UGSP to date, including both scholars and non-awardees. This chapter describes the data and explains how we used that information to address the research questions.

ADMINISTRATIVE RECORDS DATA

OLRS administrative records on all applicants and on the subset of applicants who eventually became Scholars formed the basis for the sampling frame we used to identify the universe of respondents for the survey. These records contain the information supplied by students at the time of application, their final disposition (Scholar, finalist, or semi-finalist), and the scores given by the OLRS review committee to the applications on five dimensions: academic performance, interest in science, communication skills, leadership skills, and general potential.[2] Scholar data includes information on their summer internship experiences and mentors as well as dates and status of payback completion.

Despite their usefulness, the administrative data have some limitations because the electronic records date back only to 1999. As a result, we are missing data on gender and race/ethnicity for cohorts that applied before that year. Application scores became available as of 2000, but before then, OLRS did not have a separate category for semi-finalists.

[2] Individuals who were not funded could reapply. For this report we classified reapplicants according to the year in which they advanced furthest in the process.

Therefore, MPR staff reviewed paper applications and identified, for the years possible—1997 and 1998, the full set of applications that were deemed complete and therefore could have included semi-finalists had such a distinction been made. The resulting database (summarized in Table II.1) includes all 103 Scholars who have gone through the program since its inception, all 107 finalists since inception, and 43 semifinalists since 2000 in addition to 172 unspecified applicants from 1997 and 1998, individuals who might have been semi-finalists had the distinction been made.[3]

Table II.1. UGSP Applicants by Year and Final Disposition

	Application Status (Disposition)				
Year of Best Application	Awarded Scholar	Finalist	Semifinalist	Possible Semifinalist	Total
1996	13	22	0	0	35
1997	19	17	0	88	124
1998	14	11	0	84	109
1999	10	14	0	0	24
2000	14	8	11	0	33
2001	10	12	13	0	35
2002	10	14	13	0	37
2003	13	9	6	0	28
All years	**103**	**107**	**43**	**172**	**425**

CAREER SURVEY OF SCIENCE-ORIENTED SCHOLARS

The primary data source for the outcomes evaluation was the Career Survey of Science Oriented Scholars (CSSOS). The CSSOS was designed by MPR for this study and administered during the winter of 2004-05. The target respondent population included the universe of all UGSP scholars and finalists since the program's inception. The survey was a self-administered questionnaire with telephone follow-up. The overall response rate was 59 percent for the main analysis sample.[4]

[3] These counts include only applicants through 2003. Applicants in 2004 were excluded because they would not have begun their participation in the program's summer activities by the time of the survey in the middle of the 2004-2005 academic year.

[4] The analysis sample for this report consists of Scholars and finalists. We also attempted to survey semi-finalists who were not selected to be finalists. Including this group, which had greater representation in the

The response rate was not higher largely because it was difficult to locate sample members using old contact information from applications that were filed up to nine years earlier, some of which only provided temporary school addresses. With a follow-up period that ranged up to nine years, this challenge was formidable. Scholars' contact information was kept up to date by OLRS over time, but unfunded applicants' information was not. Not surprisingly, response rates (shown in Table II.2) were higher for scholars than for non-awardees (69 versus 49 percent) and for more recent cohorts of applicants than earlier ones (71 percent for applicants since 2000 versus 49 percent for applicants before 2000). MPR's telephone interviewers reported that, once located, respondents were cooperative and rarely refused to complete the questionnaire.

The lack of current contact information is likely to have played an important role in the sample's makeup. If more motivated and talented finalists changed their residence with greater frequency than other finalists, then the finalists in our survey sample would have misleadingly poor outcomes. Or the reverse could be true, and the outcomes could be misleadingly higher in the sample than in the full population. Because we made aggressive use of traditional and nontraditional locating methods, and because many of the most elusive cases involved applicants with commonly occurring names (a factor that is probably unrelated to outcomes of interests), we believe that the sample of survey respondents was representative. In terms of gender, race, and region—the only characteristics for which we could compare respondents to the full population—the groups look very similar (Table II.3).

PROFILE OF UGSP FINALISTS AND SCHOLARS

The survey data provide a profile of who applies to and is selected for the UGSP (Table II.3). The Scholars in our survey sample were similar to non-awarded finalists in several respects and differed slightly in terms of gender and race/ethnicity. A larger proportion of Scholars than non-awardees are male, although males are in the minority in both groups, making up nearly half of all Scholars and about one in every three non-awarded finalists. Scholars and finalists are ethnically diverse, but African Americans, Hispanics, and the group labeled "Multiple/other/unknown" race appear in larger proportions among Scholars than they do among non-awarded finalists—26, 22, and 2 percent, respectively. White and Asian respondents, on the other hand, make up smaller proportions of Scholars than do non-awarded finalists.

(*continued*)
earlier cohorts, the response rate was 51 percent but changing definitions of semi-finalist made the group's findings difficult to interpret.

Table II.2. Response Rates by Subgroup

Subgroup	Response Rate	N
Gender		
Male	64.6	65
Female	66.7	78
Unknown or Missing	43.3	67
Race/Ethnicity		
White, Non-Hispanic	77.8	18
African American, Non-Hispanic	54.1	37
Hispanic	55.0	40
Asian or Pacific Islander	86.7	15
Native American	33.3	3
Unknown or Missing	54.6	97
Region of Permanent Residence at Application		
Northeast	58.9	73
Southeast	60.9	23
North Central	64.7	17
South Central	62.5	32
Northwest	87.5	8
Southwest	57.1	42
Unknown or Missing	26.7	15
Year of Application to UGSP		
1996	34.3	35
1997	52.8	36
1998	60.0	25
1999	54.2	24
2000	54.5	22
2001	77.3	22
2002	75.0	24
2003	77.3	22
Scholar Status		
Scholar	68.9	103
Finalist	48.6	107
Full Sample	**58.6**	**210**

Table II.3. Characteristics of UGSP Scholars and Finalists

Characteristic	Scholars	Finalists
Gender (Percent Male)	46.5	34.6
Race/Ethnicity		
White, non-Hispanic	23.9	30.8
African American, non-Hispanic	28.2	25.0
Hispanic	31.0	21.2
Asian, Hawaiian or Other Pacific Islander	11.3	19.2
Multiple, Other, Unknown	5.6	1.9
Missing	0.0	1.9
Region of birth		
Northeast	7.0	19.2
Midwest	14.1	9.6
South	18.3	23.1
West	25.4	19.2
Unspecified US	1.4	1.9
Foreign/US Territory	33.8	26.9
Highest educational attainment by either parent		
No high school degree	16.9	0.0
High school degree	12.7	13.5
High school degree and some college	12.7	32.7
Four year college degree	57.8	51.9
Missing	0.0	1.9
Sample Size	71	52

Source: Career Survey of Science-Oriented Scholars.

There were no large differences in the distribution of birthplace or expected year of graduation between scholars and non-awarded finalists. No single geographic region appeared dominant in either group. Midwestern states contributed fewer people to each group than any other region. Expected year of college graduation, which reflects both the year of application (shown in Table II.1) and the applicants' entering "grade" (freshman, sophomore, junior, or senior), followed a similar pattern for both groups (Table II.4). Over half of the Scholars and finalists expected to complete college between 2000 and 2003. In terms of their parents' education, more Scholars than finalists had a parent who finished college, 58 versus 52 percent, but there was also a greater proportion of Scholars than finalists with a parent who had dropped out of high school, 17 percent versus zero.

Table II.4 Distribution of Expected Graduation Years

Graduation Year	Scholars	Finalists
1996-1999	21.4	28.0
2000-2003	56.3	51.4
2004-2007	22.3	20.6
Sample Size	103	107

Source: MPR calculations using data from the NIH Office of Loan Repayment and Scholarship.

CHAPTER III

PROGRAM EXPERIENCES OF UGSP APPLICANTS

Participation in the UGSP goes well beyond receipt of a scholarship. First, scholars are paired with a university-based mentor. Next, for each year of funding they take on a supervised summer research internship at the NIH campus in Bethesda, Maryland where they take part in lectures, peer support, and career enrichment activities. And finally, they incur a service obligation to work at the NIH when they complete their undergraduate or graduate training, also known as "payback completion." This chapter addresses the question of the extent to which Scholars reported participating in these activities. We also report on similar activities in which finalists not chosen for the UGSP engaged.

PARTICIPATION IN MENTORING AND OTHER ACADEMIC SUPPORT PROGRAMS

Survey data allow us to compare Scholars' self-reported participation in academic support programs, which include the UGSP, and finalists' self-reported participation in similar programs.[5] Each Scholar receives the full array of UGSP benefits: scholarship money, summer employment, mentoring, and a peer support network. In order to determine how they perceived the UGSP, we asked whether they participated in any programs that offered these services, without specifying the UGSP. Scholars' survey responses often omitted one or more of these benefits.[6] Tables III.1 and III.2 provide information on self-reported program participation for UGSP Scholars and finalists. Large majorities of Scholars reported participating in a program that provides a scholarship or fellowship (90 percent) and in one that provides science-related summer employment opportunities (93 percent). Just over half (57 percent) of Scholars reported participating in a mentoring program. Almost 30 percent of Scholars reported participating in a peer support program.

[5] We refer to non-awarded finalists simply as "finalists" throughout the report.

[6] The Career Survey of Science Oriented Scholars (CSSOS) purposely avoided any mention of UGSP in order to elicit equivalent responses for both Scholars and non-awardees.

Table III.1. Program Participation

Program Type	Percent Participating	
	Scholars	Finalists
Peer support program	29.0	19.2
Scholarship or fellowship program	89.5	46.8
Summer work experience in a lab or science related organization	93.4	76.6
Mentoring program	56.6	36.2

Table III.2. Reporting of UGSP Participation by Scholars

How UGSP Status Was Reported	Number	Percentage
Did not report	20	28.2
Scholarship or fellowship only	18	25.4
Scholarship/fellowship and summer experience	15	21.1
Scholarship/fellowship and other combination	11	15.5
Other combination (not scholarship)	7	9.9
All Scholars who responded	71	100.0

Note: Respondents were asked if they participated in any of the four program types and if so, to list the name of the program(s). The frequencies refer to the number of scholars by the combination of program type under which they volunteered UGSP as a response.

The survey data also suggest that finalists often found support similar to that offered by the UGSP, although not to the same extent. Nearly half (47 percent) of finalists reported participating in scholarship or fellowship programs. About three in every four finalists reported participating in a program that provides science-related summer employment opportunities. About one in every three participated in a mentoring program, and about one in every five participated in a peer support program. However, the fact that 28 percent of Scholars did not offer UGSP as a response suggests that, at least for Scholars, participation in these programs was under-reported.

Most of our sample members had a mentor in college, but UGSP Scholars reported having a mentor at higher rates than finalists. Tables III.3, III.4, and III.5 provide information on the mentoring experiences of Scholars and finalists. Fewer than 15 percent of Scholars did not have a mentor in college. In contrast, about 25 percent of finalists did not have a mentor. A larger proportion of Scholars than finalists reported meeting frequently with their mentor (at least once per week, see Table III.3). Larger proportions of

finalists than Scholars reported having a mentor with a background outside of "biology, chemistry, medicine, or a related field" (see Table III.4). Among Scholars and finalists with mentors, both received the various types of mentoring advice covered by the survey with a few exceptions (see Table III.5), but a smaller proportion of Scholars than finalists received mentoring advice on jobs after college. A larger proportion of Scholars than finalists received advice about graduate school decisions and general career advice. These differences may reflect Scholars' higher rate of graduate school attendance (see Chapter IV for more details).

Table III.3. Frequency of Meetings with Mentors (Percentages)

Frequency of Meetings	Scholar	Finalist
More than 2 times per week	11.3	7.7
1-2 times per week	49.3	36.5
1-2 times per month	9.9	21.2
3-4 times during the school year	14.1	5.8
Did not have a mentor	14.1	25.0
Missing	1.4	3.9

Table III.4. Mentor Background

Home Department of Mentor	Scholar	Finalist
Biology, chemistry, medicine, or related field	78.9	55.8
Mathematics or physics	1.4	9.6
Social sciences or humanities	2.8	7.7
Other/unknown	2.8	1.9
No mentor	14.1	25.0

Table III.5. Mentor Quality Among Those with Mentors

Issue	Percentage Who Said Their Mentor Was "Somewhat" or "Very" Helpful	
	Scholar	Finalist
Course selections	65.6	56.4
Other academic advice	88.5	89.7
Graduate medical school decisions	86.9	71.8
Recommendation letters	91.8	82.1
Job opportunities during college	52.5	53.8
Job opportunities after college	18.0	35.9
General career advice	95.1	79.5
Personal advice	67.2	71.8

SUMMER EXPERIENCES

The summer research experience at the NIH is a unique aspect of the UGSP that could account for a portion of any value added effect of the program. The location and nature of summer work may affect a student's ability and motivation. Tables III.6 through III.10 provide information about the nature and quality of the summer employment reported by Scholars and finalists during the first summer after they applied to the UGSP.

Tables III.6. Characteristics of First Summer Job After Application Year

Characteristic	Scholars	Finalists
Position (percentage)		
No position reported	20.3	51.9
Research assistance/intern/lab worker	76.8	38.5
Teacher/tutor	0.0	1.9
Other	2.9	7.7
Setting (percentage)		
No position given	20.3	51.9
Government agency, including NIH	63.8	3.9
Private research lab	2.9	1.9
College or university	8.7	32.7
Business or industry	1.5	1.9
Hospital or clinic	1.5	5.8
Other	1.5	1.9
Percentage working for no pay (volunteer)	3.6	20.0
Average hourly pay for those who did work for pay (inflation-adjusted 2003 dollars)	$8.26	$5.30

Table III.7. Activities Participated in First Summer Job After Application Year (Percentages)

Activity	Scholars	Finalists
Observed research activities others were doing	90.6	84.0
Attended lectures that presented information about current work in science	90.9	68.0
Collaborated in ongoing research with regular staff from the organization	92.7	72.0
Designed and implemented my own research or investigation under supervision of a mentor	63.6	52.0
Operated instruments, equipment, and other technologies	92.7	76.0
Participated in conducting research or collecting data out in the field	34.6	32.0
Read academic literature or journal articles	96.4	88.0
Prepared a document about the work that I did	87.3	64.0
Gave a presentation on what I learned or an activity in which I participated	92.7	60.0

Table III.8. Lessons Learned in First Summer Job After Application Year (Percentages)

Lesson	Scholars	Finalists
Gained greater understanding of fundamental concepts of science	96.4	80.0
Gained greater understanding of the applications of science	96.4	88.0
Increased knowledge of current issues in scientific research	94.6	84.0
Increased understanding/experience with the process of scientific inquiry	98.2	76.0
Increased knowledge of careers in science	96.4	80.0

Table III.9. Self-Reported Impacts of Summer Work Experience

	Percentage Who Said the Summer Experienced Increased Outcome "to a Great Extent"	
Outcome	Scholar	Finalist
Confidence in my abilities	78.3	50.0
Commitment to majoring in science	68.6	26.2
Interest in applied research	74.3	28.6
Motivation to pursue a career in science	74.3	38.1
Interest in pursuing graduate education in science	67.1	47.6

Table III.10. Frequency of Meetings with Summer Mentor

	Percentage	
Frequency	Scholar	Finalist
Almost every day	40.9	19.2
Once or twice a week	28.2	19.2
Once or twice a month	11.3	5.8
Unknown	4.2	21.2
No summer mentor	15.5	34.6

While Scholars were provided with meaningful jobs (i.e., relevant to their academic and/or career interests) through the summer research component at the NIH, their counterparts had mixed success at finding summer jobs that might contribute to a career in biomedical research. Fewer Scholars than finalists reported that they did not have a career-relevant job during their post-application summer (see Table III.6). A large majority of the jobs held by both groups fell into the broad category that includes research assistantships, internships, and various lab jobs. The groups differ in the typical location of their post-application summer jobs. The vast majority of Scholars who reported post-application summer jobs said that they worked for a government agency (presumably NIH). Most finalists who reported post-application summer jobs said that they worked on a university or college campus, which is presumably where many Scholars might have worked had they not participated in the UGSP. Many more finalists than Scholars did volunteer work. Of those in both groups who worked for pay, finalists received a lower hourly wage than Scholars.

The post-application summer jobs held by Scholars and finalists differed in ways beyond setting and pay. Those with summer jobs were asked to indicate which "scientific activities" they had engaged in from a list provided in the survey. During their post-application summer jobs, a larger proportion of Scholars than finalists engaged in each of these nine activities (see Table III.7). About 93 percent of Scholars reported having participated in ongoing research at their employing institution, compared with just 72 percent of finalists. Sixty four percent of Scholars reported having designed and implemented their own experiments, compared with 52 percent of finalists. The only activity in which a majority of Scholars did not participate was field research (35 percent).

Survey respondents were asked to assess both the lessons they learned at summer jobs and the impact of those jobs on their interest in and motivation to pursue biomedical research. Scholars were nearly unanimous in reporting that their post-application summer work experiences contributed substantially and in a number of ways to their understanding of research (see Table III.8). Smaller but still significant majorities of finalists responded similarly about their post-application summer experiences. Larger differences exist in the self-assessed impact of summer work on various measures of enthusiasm about science. About two in every three Scholars indicated that their post-application summer work experience solidified their commitment to major in science "to a great extent." Just one in

every four finalists gave that same assessment. About three in every four Scholars reported that their post-application summer work experience increased their interest in applied research "to a great extent." Nearly three in every four Scholars reported that their post-application summer work experience made them more motivated to pursue a career in science "to a great extent." A minority of finalists reported the same. These self-reported impacts would tend to support the possible existence of UGSP's value added effects.

PAYBACK COMPLETION

After finishing their formal education, Scholars are required to work for one year at the NIH for every year of UGSP support received. These years are known as "payback." Scholars may begin payback directly after they graduate from their undergraduate institution or may defer it until after graduate school. The latter is probably more desirable from the perspective of NIH because the Scholars come better trained than they would with only a bachelor's degree. Scholars who received UGSP support for multiple years may begin payback before graduate school and finish it afterwards. OLRS administrative records, which allow us to calculate the year of expected graduation as of the date of UGSP application, include the dates of payback work. Table III.11 shows the payback status of Scholars by cohorts of years since "expected graduation year." Of the 88 Scholars expected to graduate in 2004 or earlier, 44 had completed payback. Another 7 Scholars had started but had not completed payback.

Because administrative data do not include information on graduate education, payback timing relative to graduate school can be determined for survey respondents only. The respondents include 58 Scholars with expected undergraduate graduation dates in 2004 or earlier (see Table III.12). Of those, 27 (47 percent) completed payback before completing graduate school. Only one respondent had completed payback after completing graduate school. The remaining 30 (52 percent) will presumably end up in one of those two categories but had not completed graduate school or payback at the time of the survey.

Table III.11. UGSP Scholars by NIH Payback Completion Status

Years Since Expected Graduation	Number of Scholars: Not Started Payback	Started Payback	Completed Payback	Total	Percent Completed
0.5	6	0	2	8	25%
1.5	8	1	6	15	40%
2.5	8	1	2	11	18%
3.5	4	4	8	16	50%
4.5	5	0	11	16	68%
5.5	6	1	2	9	22%
6.5	7	0	5	12	41%
7.5	0	0	1	1	100%
Total	**44**	**7**	**37**	**88**	**42%**

Source: MPR calculations based on data from UGSP administrative records.

Table III.12. NIH Payback Timing

Status	Number	Percentage
Payback completed before or during graduate school	27	46.6%
Possible post-graduate payback	30	51.7%
Payback completed after graduate school	1	1.7%
Total	**58**	**100.0%**

Source: MPR calculations based on data from UGSP administrative records and the CSSOS.

CHAPTER IV

OUTCOMES FOR SCHOLARS AND FINALISTS

The UGSP's goals can be defined in terms of program outcomes, both long-term and intermediate. Long-term outcomes cannot be observed until the program is in place for many years because the training "pipeline" for biomedical research is quite long. Intermediate outcomes are therefore critical to assessing the UGSP. Broadly speaking, the program's intermediate goal is that Scholars should make appropriate progress toward meeting the requirements for a tenured, tenure-track, or intramural research position at the NIH or the equivalent. The measures of being "on track" for such positions are unique to a Scholar's position in the education and training pipeline. In this chapter, we examine several sets of these measures related to college, graduate school, and the labor market.

OUTCOMES DURING COLLEGE

On average, Scholars and finalists had strong academic records in college. They had high grade point averages (GPAs), both overall and in their major, but the Scholars' GPAs were higher for each measure (see Table IV.1).[7] The average overall GPA for Scholars was 3.64, compared to 3.55 for finalists; for each group, the GPA in a major was slightly higher, 3.66 and 3.59 for Scholars and finalists, respectively. Because UGSP applicants are required to have an overall GPA of 3.5 when they apply and while they are receiving UGSP funding, the high grades are not surprising.

The share of students with a GPA greater than 3.5 was much higher for Scholars than for finalists, both overall (86 versus 71 percent) and in a major (87 versus 79 percent). However, an early goal for Scholars is to stay on track by continuing to meet the UGSP standards even if the Scholar is no longer being funded. By this standard, it appears that about one in seven Scholars failed to continue to meet the requirement, as did twice as many finalists. Those who fell below the standard may have done so because they took more difficult upper-level classes relative to earlier coursework or because their academic performance declined when it was no longer being monitored for program eligibility.

[7] GPAs are based on current grades at the time of the survey for students who were still enrolled in school and grades at graduation for students who were no longer in school.

Table IV.1. Outcomes During College

Outcomes	Scholars	Finalists
Academic Achievement		
GPA overall (average)	3.64	3.55
GPA overall > 3.5 (percent)	85.9	71.2
GPA in major (average)	3.66	3.59
GPA in major > 3.5 (percent)	87.3	78.9
Dean's list (percent of semesters)	76.9	78.4
Dean's list > 75% of semesters (percent)	77.5	76.9
Field of Study (percent)		
Biomedical field	88.7	78.4
Biomedical field or bio, chem, pre-med major	91.6	82.7
Biomedical field or bio, chem, pre-med major or minor	93.0	84.6
Sample Size (All Survey Respondents)	71	52

Both Scholars and finalists were on the Dean's List for a large share of semesters, another measure of academic achievement but one that may vary by institution. We found that both groups were on the Dean's List for more than 6 out of 8 semesters, on average (77 percent of semesters for Scholars, 78 percent for finalists). Similarly, there was little difference between the two groups in the proportion of sample members on the Dean's List for 75 percent of his or her semesters in college.

While in college, nearly all UGSP Scholars took courses that would lead to a career in biomedical research. This choice signals a commitment to the long-term goals of the NIH. To measure this commitment, we have created three definitions, each more "liberal" than the one before it, of what is means to major in a biomedical field (see Table IV.1): (1) majoring in a field listed as a biomedical field on the survey; (2) majoring in a field listed as a biomedical field or in biology, chemistry, or pre-med; and (3) majoring in a field listed as a biomedical field or majoring or minoring in biology, chemistry, or pre-med. According to the most conservative definition, nearly 9 out of 10 Scholars majored in a biomedical field, while almost 8 out of 10 finalists did. According to the two more liberal definitions, the proportion of students in each group who majored in a biomedical field was higher, and the gap between the Scholars and finalists narrowed from 10 percent to 8 percent.

OUTCOMES RELATED TO COLLEGE COMPLETION

In addition to outcomes during college, we measured whether students were on track by outcomes related to college completion, which include various types of honors and bachelor's degrees (Table IV.2). Half of UGSP Scholars graduated with departmental honors, compared to 36 percent of finalists. Similarly, while approximately 55 percent of Scholars and finalists graduated either *cum laude* or *magna cum laude*, twice as many Scholars as finalists graduated *summa cum laude* (16 percent compared to 8 percent).

Table IV.2. Outcomes Related to College Completion (Percentages)

Outcomes	Scholars	Finalists
Honors		
Departmental honors	50.0	36.1
Degree honors		
Any Latin honors	71.4	63.9
Cum laude	25.0	30.6
Magna cum laude	30.4	25.0
Summa cum laude	16.1	8.3
College Degree		
Any degree	100.0	100.0
Bachelor of Science degree		
Any field	80.7	54.1
Biomedical field	75.4	51.4
Biomedical field or bio, chem, pre-med major	77.2	54.1
Biomedical field or bio, chem, pre-med major or minor	79.0	54.1
College Degree in Four Years		
Any degree	68.4	67.6
Bachelor of Science degree		
Any field	54.4	35.1
Biomedical field	52.6	35.1
Biomedical field or bio, chem, pre-med major	52.6	35.1
Biomedical field or bio, chem, pre-med major or minor	54.4	35.1
Sample Size (College Graduates)	57	37

The key indicator of a Scholar staying on track through the end of college is the attainment of a bachelor's degree in a biomedical field, or a B.S. Using any of the three definitions specified above, we found that over 75 percent of Scholars who had finished college received a B.S., and over 52 percent of Scholars did so within four years of entering college. In contrast, barely more than half of the finalists who had completed college graduated with a B.S. in a biomedical field, only 35 percent did so within four years.

OUTCOMES RELATED TO GRADUATE SCHOOL

Outcomes related to graduate school can also measure student's progress toward USGP goals. These outcomes include making acceptable progress toward either a Ph.D. in a biomedical field or an M.D. at an accredited medical school (or both in a joint program), and subsequently completing the degree program(s). Several measures of progress are presented in Table IV.3: taking graduate school admissions tests, applying (or intending to apply) to graduate school, attending graduate school, receiving a degree, and authoring articles.

Table IV.3. Outcomes Related to Graduate School (Percentages)

Outcomes	Scholars	Finalists
Graduate School Admissions Tests Taken		
Any GRE or MCAT	82.5	75.7
GRE general test	35.1	35.1
GRE subject test	15.8	8.1
MCAT	59.7	54.1
Applied or Intended to Apply		
Any Ph.D. or M.D.	91.2	70.3
Ph.D.	40.4	29.7
M.D.	38.6	48.7
Joint M.D./Ph.D.	36.8	16.2
Graduate School Attendance		
Attended graduate school	79.0	66.7
Attended graduate school within 7 years of starting college	54.4	46.0
Intended degree Ph.D. or M.D.	71.9	47.2
Biomedical field of study	57.9	47.2
Degrees Earned		
Received M.D. or Ph.D.	7.0	8.3
Graduate degree was in biomedical field	5.3	5.4
Sample Size (College Graduates)	57	37

After graduating, most Scholars stay on track as measured by graduate school exams and applications. Over four-fifths of Scholars took either a Graduate Record Exam (GRE) or Medical College Admissions Test (MCAT), compared to approximately three-quarters of finalists. Scholars and finalists took the General GRE test at similar rates (35 percent), but a higher percentage of Scholars took the GRE Subject test (16 versus 8 percent) or the MCAT (60 versus 54 percent). Scholars subsequently applied (or intended to apply) to Ph.D. programs at a higher rate (40 percent) than did finalists (30 percent). On the other hand, nearly half of the finalists applied to an M.D. program, compared to 38 percent of Scholars. While these differences offset each other, there is a 21 percentage point difference in the rate of application for joint M.D./Ph.D. programs, with 37 percent of Scholars taking this route, compared to 16 percent of finalists.

Overall, a larger share of Scholars than finalists applied or intended to apply to graduate school and subsequently enrolled. Over 90 percent of Scholars intended to apply for an M.D., Ph.D., or joint program, compared to 70 percent of finalists; nearly 80 percent of Scholars attended graduate school, compared to two-thirds of finalists. In terms of staying on track for a career as a biomedical researcher, 54 percent of Scholars had enrolled in graduate school within seven years of starting college, compared to 46 percent of finalists. This gap might have been still larger if more Scholars had not delayed graduate school to complete their payback.

A much higher share of Scholars than finalists pursued an M.D., Ph.D., or both in graduate school (72 versus 47 percent). Furthermore, a larger percentage of Scholars than finalists pursued a degree in a biomedical field (58 versus 47 percent). For nearly all students, the time between applying to the UGSP and the administration of the survey in late 2004 and early 2005 was not long enough to have completed graduate school. However, by the time of the survey, 7 percent of Scholars had received either an M.D. or Ph.D., with three-quarters of those in a biomedical field; for finalists, 8 percent had received either an M.D. or Ph.D., with two-thirds of those degrees in a biomedical field.[8]

PROFESSIONAL OUTCOMES

Professional outcomes are the third intermediate measure of USGP success. These include job characteristics, labor market outcomes, and professional authorship, as presented in Table IV.4. Not surprisingly, Scholars reported having a job at NIH as their most recent position significantly more often than did finalists (58 percent versus 9 percent). Finalists, in turn, more often reported having an academic position (39 versus 24 percent); a government position (8 versus 0 percent); a private, non-academic position (17 versus 9 percent), or another position (13 versus 6 percent). Slightly higher percentages of finalists than Scholars reported having held a job since finishing school (62 versus 58 percent) and earning a high annual salary (71 versus 67 percent), defined as more than $50,000. Compared to Scholars, a larger percentage of finalists held a medical residency, post-doctoral fellowship, or sub-specialty fellowship (26 versus 21 percent); however, these outcomes were relatively rare for both Scholars and finalists, with fewer than 10 percent of either group in any one of these three categories.[9]

In their most recent jobs, a larger percentage of Scholars than finalists reported that they conducted lab research (62 versus 38 percent), while a higher share of finalists indicated having administrative responsibilities (35 versus 10 percent). We also find a 31 percentage point gap between the share of Scholars and finalists who reported publishing an article in a peer-reviewed journal (74 versus 43 percent), and on average, Scholars had authored more than twice as many peer-reviewed articles (2.1 versus 1.0).

USING MULTIVARIATE REGRESSION TO INTERPRET DIFFERENCES

The simple comparisons presented in Tables IV.1 through IV.4 suggest that UGSP Scholars made progress toward becoming a biomedical researcher at higher rates than non-awarded finalists. But as we pointed out in Chapter I, such differences may reflect the joint action of a selection effect and a value-added effect, the former being the difference in talent and motivation between finalists who were and were not selected to become Scholars, and

[8] Biomedical field was defined as biochemistry, chemistry, genetics, medicine, or pharmacology.

[9] Because many Scholars had taken time after college to complete their payback, they may not have reached this point in their careers.

Table IV.4. Professional Outcomes

Outcomes	Scholars	Finalists
Institution Type		
NIH	57.6	8.7
Academic	24.2	39.1
Government	0.0	8.7
Private, nonacademic	9.1	17.4
Other	6.1	13.0
Position Types Held		
Medical residency	9.1	8.7
Postdoctoral fellowship	6.1	8.7
Subspecialty fellowship	6.1	8.7
Job Responsibilities		
Teaching/training others	13.5	12.5
Laboratory research	62.4	37.5
Chemical research	8.1	8.3
Patient care diagnosis	5.9	6.9
Administration	10.2	34.7
Labor Market Outcomes		
Share of college graduates employed	57.9	62.2
Most recent salary over 50K	66.7	71.4
Articles in Peer-Reviewed Journals		
Any published	73.7	43.2
Number published (average)	2.1	1.0
Sample Size (Employed)	33	23

the latter being the difference between actual Scholar outcomes and the outcomes they *would have achieved* if the UGSP did not exist.

One way to disentangle the two effects is to examine Scholar-finalist differences in career outcomes and the share of each group staying on track while controlling for other variables in addition to UGSP participation. While the statistics in Tables IV.1 through IV.4 can be used to calculate simple Scholar-finalist differences, a multivariate regression model allows us to re-estimate the Scholar-finalist difference after controlling for other factors, such as parents' education and the numeric rating scores from the UGSP application. If the gap between the outcomes of the two groups narrows when controlling for background variables, selection effects are likely to be operating; on other hand, if control variables do *not* affect the relationship between UGSP status and outcomes, the UGSP's value added is contributing to the difference. However, even in the latter case, we cannot conclude that the difference is purely value added (impact) because there could still be unmeasured personal characteristics that distinguish Scholars from finalists even before they were exposed to the UGSP.

In each regression model, we focus on the UGSP effect, the coefficient on a binary indicator for whether the sample member was a Scholar or finalist. These coefficients are presented in Tables IV.5 to IV.8, which correspond to each of the outcomes shown in Tables IV.1 to IV.4. Each cell entry was estimated from a separate regression, each row represents a separate outcome, and each column contains one of four regression specifications: (I) using Scholar only, (II) using Scholar and student background characteristics (gender, race/ethnicity, whether born in the U.S., lived in the U.S., mother's and father's education, and expected year of college graduation), (III) using Scholar, student background characteristics, and major life events (self-reports of academic, family, or health crises), and (IV) using Scholar, student background characteristics, major life events, and the scores from the applications in each of five dimensions.[10] The findings from specification I should be equal to the differences in average outcomes presented in Tables IV.1 to IV.4, reflecting the unadjusted difference between Scholars and finalists. The remaining specifications have progressively more control variables.[11]

REGRESSION RESULTS

The regression results tend to show that as we added control variables, the effect of UGSP on outcomes did not change very much. This finding suggests that the Scholar-finalist difference in outcomes is a result of the value added by the UGSP, although the evidence is far from conclusive because we have a very small number of explanatory variables. With the addition of application scores to the regression, however, many of the coefficients on UGSP participation changed drastically. Nevertheless, the change in estimated UGSP effect was due almost entirely to the fact that only a fraction of the sample, the most recent cohorts, had such scores. The sample was very small and hence, unreliable.

For outcomes related to college achievement and completion, the only consistently statistically significant findings were associated with attaining a bachelor's degree in a biomedical field. Using any of the definitions, Scholars were much more likely than finalists to receive a bachelor's in a biomedical field, overall and within four years of entering college (see Table IV.6). This finding essentially holds true in size or significance as more control variables were added. However, when application scores were included in the regression, the magnitude of the finding was less and not statistically significant, suggesting that Scholars may have been motivated to pursue a degree in a biomedical field absent the program.

The effects of UGSP participation are most obvious with respect to graduate school. While we found earlier that Scholars were more likely than finalists to take the MCAT and apply for joint M.D./Ph.D. programs, additional control variables made these program

[10] Statistical significance is indicated by *** if the coefficient is significant at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

[11] The application scores were only available for students who were planning to graduate college in 2001 or later. As such, the sample sizes for the last specification are quite small, reducing the likelihood that an impact will be found to be statistically significant.

Table IV.5. Outcomes During College, Regression Results

Outcomes	UGSP Effect, by Regression Model			
	I	II	III	IV
Academic Achievement				
GPA overall (average)	0.09	0.12**	0.06	0.06
GPA overall > 3.5	0.11	0.14	0.13	-0.24
GPA in major (average)	0.07	0.08	0.09	-0.18*
GPA in major > 3.5	0.16	0.15	0.09	-0.19
Dean's list (percent of semesters)	-0.01	-0.02	-0.07	-0.11
Dean's list > 75% of semesters	-0.09	-0.08	-0.05	-0.04
Field of Study				
Biomedical field	0.10	0.14*	0.08	0.09
Biomed, bio, chem, pre-med major	0.09	0.07	0.02	-0.02
Biomed, bio, chem, pre-med major / minor	0.08	0.07	0.05	0.06
Sample Size (All Survey Respondents)	123	116	91	35

*Significantly different from zero at the .10 level, two-tailed test.
**Significantly different from zero at the .05 level, two-tailed test.
***Significantly different from zero at the .01 level, two-tailed test.

effects even stronger (see Table IV.7). In fact, in the full specification, which included application scores, the impacts are much larger: Scholars were more likely than finalists to take the MCAT and apply for a joint program (by 46 and 59 percentage points, respectively).

In graduate school, Scholars were significantly more likely than finalists to be enrolled in an M.D. or Ph.D. program. Moreover, while most of the impacts of UGSP participation are insignificant, we find that pursuing a biomedical field of study in graduate school was much more likely for Scholars. Again, the gaps between Scholars and finalists enrolling in an M.D. or Ph.D. program and pursing a biomedical field of study increase as more controls are included in the model, and are at their largest when the admissions scores are used in the regression. Combined, these findings suggest that the UGSP had a direct effect on Scholars, motivating them to enroll in graduate school, particularly in a joint M.D./Ph.D. program and in the continued pursuit of biomedical studies.

In the group of employed Scholars and finalists, the former were much more likely to get a job at the NIH or to have a job with laboratory research responsibilities (see Table IV.8); these findings are fairly consistent across the first three specifications. (The last column pertains to only 18 sample members.) Finally, with regard to publications, Scholars were significantly more likely to have published at all and, on average, to have published more articles.

Table IV.6. Outcomes Related to College Completion, Regression Results

Outcomes	UGSP Effect, by Regression Model			
	I	II	III	IV
Honors				
Departmental honors	0.14	0.14	0.07	-0.10
Degree honors				
Any Latin honors	0.08	0.08	0.05	-0.11
Cum laude	-0.06	-0.02	0.00	-0.31
Magna cum laude	0.05	-0.02	-0.02	0.09
Summa cum laude	0.08	0.12	0.08	0.11
College Degree				
Any degree	n.a.	n.a.	n.a.	n.a.
Bachelor of Science degree				
Any field	0.27***	0.25**	0.23**	0.05
Biomedical field	0.24**	0.23**	0.17	0.05
Biomedical field or bio, chem, pre-med major	0.23**	0.22**	0.17	-0.06
Biomedical field or bio, chem, pre-med major / minor	0.25***	0.24**	0.20*	0.05
College Degree in Four Years				
Any degree	0.01	0.02	0.00	0.14
Bachelor of Science degree				
Any field	0.19*	0.21*	0.15	0.13
Biomedical field	0.17*	0.19*	0.13	0.02
Biomedical field or bio, chem, pre-med major	0.17*	0.19*	0.13	0.02
Biomedical field or bio, chem, pre-med major / minor	0.19*	0.21*	0.15	0.13
Sample Size (College Graduates)	94	91	91	35

*Significantly different from zero at the .10 level, two-tailed test.
**Significantly different from zero at the .05 level, two-tailed test.
***Significantly different from zero at the .01 level, two-tailed test.

Table IV.7. Outcomes Related to Graduate School, Regression Results

Outcomes	UGSP Effect, by Regression Model			
	I	II	III	IV
Graduate School Admissions Tests Taken				
Any GRE or MCAT	0.07	0.09	0.10	0.29
GRE general test	0.00	0.01	0.00	-0.25
GRE subject test	0.08	0.05	0.05	0.09
MCAT	0.06	0.08	0.10	0.46*
Applied or Intend to Apply				
Any Ph.D. or M.D.	0.21***	0.24***	0.28***	0.33**
Ph.D.	0.11	0.10	0.13	-0.25
M.D.	-0.10	-0.06	0.00	0.28
Joint M.D./Ph. D.	0.21**	0.24**	0.28**	0.59*
Graduate School Attendance				
Attended graduate school	0.12	0.13	0.17	0.34
Attended grad school within 7 years of starting college	0.08	0.07	0.08	0.02
Intended degree Ph.D. or M.D.	0.25**	0.26**	0.27**	0.31
Biomedical field of study	0.11	0.13	0.20*	0.30
Degrees Earned				
Received M.D. or Ph.D.	-0.01	-0.04	-0.07	n.a.
Graduate degree was in biomedical field	0.00	-0.01	-0.04	n.a.
Sample Size (College Graduates)	94	91	91	35

*Significantly different from zero at the .10 level, two-tailed test.
**Significantly different from zero at the .05 level, two-tailed test.
***Significantly different from zero at the .01 level, two-tailed test.

Table IV.8. Professional Outcomes, Regression Results

Outcomes	UGSP Effect, by Regression Model			
	I	II	III	IV
Institution Type				
NIH	0.49***	0.47***	0.41***	-0.14
Academic	-0.15	-0.15	-0.14	0.38
Government	-0.09*	-0.03	-0.04	n.a.
Private, nonacademic	-0.08	-0.12	-0.14	-0.63
Other	-0.07	-0.05	-0.02	-0.29
Position Types Held				
Medical residency	0.00	0.02	-0.02	n.a.
Postdoctoral fellowship	0.06	0.04	0.06	0.12
Subspecialty fellowship	-0.03	-0.05	-0.09	n.a.
Job Responsibilities				
Teaching/training others	0.01	0.05	0.12	-0.11
Laboratory research	0.25*	0.20	0.20	0.15
Chemical research	0.00	-0.01	-0.06	0.52
Patient care diagnosis	-0.01	0.02	0.07	-0.07
Administration	-0.25**	-0.26**	-0.33**	-0.48
Labor Market Outcomes				
Share of college graduates employed	-0.04	-0.07	-0.07	0.42
Most recent salary over 50K	-0.05	-0.16	-0.25*	0.21
Articles in Peer-Reviewed Journals				
Any published	0.30***	0.22**	0.19*	0.16
Number published (average)	0.88**	0.68*	0.83*	0.89
Sample Size (Employed)	56	54	54	18

*Significantly different from zero at the .10 level, two-tailed test.
**Significantly different from zero at the .05 level, two-tailed test.
***Significantly different from zero at the .01 level, two-tailed test.

CHAPTER V

CONCLUSIONS

This report presented the main findings from a survey of educational experiences and career outcomes for two groups: all participants in the UGSP since its inception in 1996 and those who applied during the same years but were not selected for the program. The results of the survey suggest that UGSP Scholars have been making steady progress toward the goal of becoming biomedical researchers. Most of them were on track at each stage of their careers from college to graduate school and employment, and even early in their careers, they have been successful, evidenced by peer-reviewed publications.

These outcomes were more positive than those for finalists according to most measures we used. The difference in outcomes between the two groups suggests that the UGSP is either effective in attracting the most motivated and talented students in the applicant pool (a selection effect), effective in both steering those students toward careers in biomedical research and enhancing those careers (value added), or a combination of both. Our attempt to decompose the difference into these two components was inconclusive, in part because of a small sample.

OUTCOMES FOR SCHOLARS

Several indicators led us to conclude that most Scholars stayed on track. While in college, the vast majority of Scholars majored in biomedical fields and maintained high grade point averages. These outcomes were expected because they are requirements for participating in the UGSP. In addition, however, most Scholars received various university honors and graduated on time with a bachelor's degree in science, which represent early indicators of positive outcomes.

When they left college, the vast majority of Scholars took the necessary steps to enter graduate school in a biomedical field (i.e., taking entrance exams and applying). Few had completed graduate school by the time of our survey, although many either were still in the pipeline or had delayed their plans for graduate school in order to begin their UGSP service obligation (payback).

The time horizon for this study was not long enough to observe whether staying on track for as long as they did led Scholars' to permanent careers in biomedical research.

Employment outcomes are more difficult to measure because so few students were out of college long enough for us to observe them in the labor force. For those who began full-time employment by the time of the survey, their job responsibilities were concentrated in laboratory research, although much of that work experience consisted of payback employment at the NIH.

OUTCOMES RELATIVE TO FINALISTS

Generally speaking, the finalists who formed our comparison group also made progress toward careers in biomedical research, but to a lesser extent than the UGSP Scholars. Finalists participated in programs with similar features as the UGSP even though they did not get into the UGSP itself. This is not surprising because they were clearly motivated and had the credentials to pursue a career in a biomedical field, as demonstrated by their initiative to apply to the UGSP and by having reached the final selection round. Nevertheless, the finalists did not report having the same extent of services and experiences in terms of mentors, peer support, and summer enrichment experiences as did the UGSP Scholars.

Despite what the finalists may share with Scholars, their outcomes were not as favorable from the perspective of NIH policymakers. For instance, the finalists more often majored in subjects other than biology or related science fields, received fewer graduation honors, and graduated on time at a lower rate than Scholars. In addition, while many finalists took graduate school entrance exams, and applied to and attended graduate school, they did so at lower rates than Scholars. By the time of the survey, a larger share of finalists than Scholars had completed graduate school or were employed, and those who were employed had higher earnings, but their job responsibilities often included administrative work, and they authored only half as many articles.

We have suggested that these differences may be due to the type of applicant that the UGSP selects or to the value added by program components (funding, peer support network, mentoring, and work experiences). However, a "rejection effect" may also explain the differences between Scholars and finalists. If non-awardees were discouraged by not being accepted into the program despite the promise they showed, they may have been more likely to turn to other careers. Given that motivation itself was one of the criteria for being selected into the program, it is unlikely that the UGSP would have strong rejection effects, but nothing in our data allowed us to test their presence.

We attempted, with limited success, to use demographic and other background variables to determine whether differences in outcomes for Scholars and finalists may have been the result of pre-existing differences in their personal characteristics as opposed to the UGSP's direct value added. For most outcomes, the findings for the two groups were similar when we controlled for background characteristics, which is consistent with the value added hypothesis. When we controlled for the scores that applicants received during the screening process, we found that the net differences were very different, often small, or negative (favoring finalists). This result, however, may have been driven by the very small sample of scores that were available for analysis. We concluded that the evidence is insufficient to fully

distinguish between the two types of effects. Future research, however, might address this important question: If the UGSP Scholars had not been offered the program, would they have achieved the same results?

OTHER FINDINGS

The UGSP's payback requirement has had mixed success in terms of bringing talented researchers directly to the NIH. This is because the requirement is just as likely to bring bachelor's degree-only candidates to campus as it is to bring advanced degree holders (PhD or MD, for example). However, one potential benefit of the UGSP remains unmeasured: the possibility that early career (post-baccalaureate) exposure to full-time employment at the NIH may make it more likely that scientists will want to work at the NIH in the future. Living near the NIH campus during the summer and experiencing the NIH culture may yet have such an effect.

STUDY LIMITATIONS

As the first report on the CSSOS, this study makes a unique contribution to policymakers' understanding of the experiences and career outcomes of UGSP Scholars in particular and the UGSP applicant pool in general. But questions about the program still remain, and the findings must be interpreted carefully. We note the following important limitations of this study:

1. ***The program has changed over the years.*** The short-term outcomes are based on all cohorts, but the longer-term outcomes such as graduate school completion and employment are based on those who have been out of college the longest and who may have experienced the UGSP in its earliest years, when program rules were different and program components were still being developed (Silva 2004). For instance, the peer network and the network of laboratory mentors was not as well developed in the early years of the program. Therefore, the sample reflects a mix of experiences over the program's life. Survey response rates were higher in recent cohorts, so recent cohorts are represented in greater proportion overall, but the findings about longer-term outcomes are based on the early cohorts.

2. ***The sample is small.*** The UGSP admits just 10 to 15 scholars per year, so any inferences we make are necessarily based on a small sample, reducing our confidence that observed findings are attributable only to the program.

3. ***The survey results may not be representative.*** Not everyone eligible for the study could be located and surveyed. In particular, many non-awardees from early cohorts, especially those with commonly occurring last names, were never found. We believe that this type of survey nonresponse is probably random with respect to the main outcomes of interest, which means it would not bias the findings.

4. ***There is no true control group.*** Strictly speaking, outcomes for the finalists do not represent the outcomes that Scholars would have had absent the program because the groups are not equivalent. That is, Scholars were judged to be more promising than finalists. As a result, we must interpret the differences as the sum of program impacts *and* the program's selection effects. The best way to make causal statements about the impact of the program as a whole or its components would be to design a prospective study that used random assignment in much the same way a randomized clinical trial is structured.

Despite these limitations, the study findings add considerably to our knowledge of the effects of supporting undergraduates on their early career decisions. Combined with the companion process study (Silva 2004) and an earlier study on outreach and recruiting (Humphrey and Glazerman 2001), the outcomes evaluation provides a detailed picture of the UGSP in its first decade.

REFERENCES

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Silva, Tim. "Operation of the NIH Undergraduate Scholarship Program." Draft report. Washington, DC: Mathematica Policy Research, Inc., November 2004.